# CITY OF KIRKLAND
# 2025 CRITICAL AREA ORDINANCE BEST AVAILABLE SCIENCE BIBLIOGRAPHY

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# I. Introduction

Under the Growth Management Act (GMA), jurisdictions are required to periodically review their comprehensive plans and development regulations, including critical area ordinances (CAO). In accordance with HB 1241 the Kirkland critical area ordinance (CAO) must be updated by December 31, 2025. Pursuant to RCW 36.70A.172(1), the CAO update must include an assessment and acknowledgement of Best Available Science (BAS).

Under the Growth Management Act (GMA), counties and cities are required to use BAS when reviewing, revising, and updating critical area policies and regulations. The State assists jurisdictions in updating their codes by defining BAS, establishing criteria for obtaining it, and offering guidance on how to apply the scientific data when applicable. Jurisdictions must demonstrate that BAS has been considered in the update of their critical areas ordinance by documenting the scientific sources referenced. BAS is defined and requirements are clarified in RCW 36.70A.172 and WAC 365-195-900 through 925.

- WAC 365-195-900: Background and purpose.
- WAC 365-195-905: Criteria for determining which information is the "best available science."
- WAC 365-195-910: Criteria for obtaining the best available science.
- WAC 365-195-915: Criteria for including the best available science in developing policies and development regulations.
- WAC 365-195-920: Criteria for addressing inadequate scientific information.
- WAC 365-195-925: Criteria for demonstrating "special consideration" has been given to conservation or protection measures necessary to preserve or enhance anadromous fisheries.

In the last comprehensive CAO update, Kirkland engaged third-party experts to conduct thorough BAS assessments. The reports prepared by The Watershed Company (FACET) in 2016 for KZC Chapter 90 updates, and by AESI for KZC Chapter 85 updates in 2018, offer valuable information for this 2025 update and are included in this BAS Bibliography. This bibliography is not an exhaustive list of resources, nor is it a comprehensive analysis of BAS in relation to the current Kirkland critical area codes. This document includes the BAS that was gathered and reviewed as part of the code update process.

# II. Comprehensive Publications: Critical Areas

Staff have identified the following resources as credible, best available science resources pertinent to general critical area decision making:


King County. Best Available Science Review and Updates to Critical Areas Protections. 2024. https://cdn.kingcounty.gov/-/media/king-county/depts/executive/performance-strategy-budget/regional-planning/2024-kccp-update/2024-cao-update/2024-kccp-bas-report-final-022724.pdf?rev=f34e1cdf1d1c4b629fc36fc79c1b95a4&hash=1C8E42D7A27DE23037B4A3354EA7D6D0

Lambert, M.R., et al. Building the Neighborhood for the Trees: Illuminating win-wins for housing densification and nature. 2025. Conservation Science and Practice. https://conbio.onlinelibrary.wiley.com/doi/10.1111/csp2.70085

Larco, N. and Knudson, K. The Sustainable Urban Design Handbook. 2024. Routledge, New York, NY.

McDonald, R.I et al. Denser and greener cities: Green interventions to achieve both urban density and nature. 2023. People and Nature 5:84-102. https://besjournals.onlinelibrary.wiley.com/doi/10.1002/pan3.10423

Municipal Research and Services Center (MRSC). Critical Areas. web page. Modified 1.07.2025. https://mrsc.org/explore-topics/environment/regulations/critical-areas#:~:text=Below%20are%20examples%20from%20local%20governments%20in,Areas%20Ordinance%20Best%20Available%20Science%20Review%20(2016)

The Watershed Company (Facet). City of Kirkland Critical Areas Regulation Technical Report. 2016 https://dupont.civicweb.net/document/31806/

University of Washington Climate Impacts Group. Web page. https://cig.uw.edu/

Washington State Department of Ecology. Washington State Climate Resilience Strategy. 2024. https://apps.ecology.wa.gov/publications/documents/2401006.pdf

Washington State Department of Commerce. A Critical Areas Handbook.v3.0. 2018. https://deptofcommerce.app.box.com/s/rlysjrfvrxpxwnm9jvbcd3lc7ji19ntp

Washington State Department of Commerce. Critical Areas Protection. Web page. Updated 1.23.2025. https://www.commerce.wa.gov/growth-management/ecosystem-planning/critical-areas/

Washington State Department of Commerce – A Guide to the Periodic Update Process Under the Growth Management Act. Revised 2022. https://deptofcommerce.app.box.com/s/dujoznyydtgpvd4yg4ar4awv5f2v8tbc

Washington Department of Commerce. Incentivizing low-impact development: Beyond permit requirements. 2022. https://www.psrc.org/sites/default/files/2022-03/buildinggreencities.pdf

Washington Department of Commerce Mapping and technical resources for critical areas monitoring and adaptive management. 2021. https://www.ezview.wa.gov/Portals/_1992/Documents/2021workshops/Webinar%201%20-%20Mapping%20and%20Technical%20Resources%20for%20Critical%20Areas%20Monitoring.pdf

# III. Individual Critical Area Resources

Staff have identified the following resources as credible, best available science resources pertinent to specific critical areas:

## a. Critical Recharge Areas

Washington State Department of Ecology. Publication 05-10-028. Critical Aquifer Recharge Areas: Guidance Document. 2021. https://apps.ecology.wa.gov/publications/summarypages/0510028.html

Washington State Department of Health. Source Water Assessment (SWAP) Map. Drinking water system points layer, Wellhead Protection area layer, Surface water protection areas. https://experience.arcgis.com/experience/9dc3fd45206d450f828ebd7ed9cdf7be

## b. Flood Prone Areas

King County. iMap: Flooding info, FEMA floodway, FEMA 100 year floodplain, FEMA 500 year floodplain layer, Regulatory floodplain layers. Updated 10.17.2024. https://gismaps.kingcounty.gov/iMap/

Federal Emergency Management Agency Flood Hazard Map – https://www.fema.gov/flood-maps

National Oceanic and Atmospheric Administration. Response Letter Regarding Implementation Standards for the NFIP Biological Opinion Reasonable and Prudent Alternative. September 26, 2011. https://www.fema.gov/pdf/about/regions/regionx/9_26_11_rpa_clarification_final.pdf

Washington State Department of Ecology: Guidance for Floodplains, Critical Areas Ordinance.

https://ecology.wa.gov/regulations-permits/guidance-technical-assistance/guidance-for-floodplains-critical-areas-ordinanc#:~:text=Jurisdictions%20in%20the

## c. Wetlands


Granger, T., T. Hruby, A. McMillan, D. Peters, J. Rubey, D. Sheldon, S. Stanley, E. Stockdale. April 2005. Wetlands in Washington State - Volume 2: Guidance for Protecting and Managing Wetlands. Washington State Department of Ecology. Publication #05-06-008. Olympia, WA. https://apps.ecology.wa.gov/publications/documents/0506008.pdf

King County. iMap: Environmentally Sensitive Areas, Wetlands National Wetland Inventory layer. 2024 https://gismaps.kingcounty.gov/iMap/ Update 2.10.2025, Accessed 3.1.2025

Modifications for Habitat Score Ranges. July 2018. https://apps.ecology.wa.gov/publications/parts/1606001part1.pdf

Sheldon, D., T. Hruby, P. Johnson, K. Harper, A. McMillan, T. Granger, S. Stanley, and E.Stockdale. March 2005. Wetlands in Washington State - Volume 1: A Synthesis of the Science. Washington State Department of Ecology. Publication #05-06-006. Olympia, WA. https://apps.ecology.wa.gov/publications/documents/0506006.pdf

Washington State Department of Ecology. Avoiding and Minimizing Wetland Impacts (n.d). https://ecology.wa.gov/water-shorelines/wetlands/mitigation/avoidance-and-minimization Accessed 03.01.2025

*Washington State Department of Ecology. Best available science for wetlands. (n.d.). https://ecology.wa.gov/Water-Shorelines/Wetlands/Tools-resources/Best-available-science. Accessed 03.01.2025*

Washington State Department of Ecology. Interagency Wetland Mitigation Guidance. Web page. https://ecology.wa.gov/Water-Shorelines/Wetlands/Mitigation/Interagency-guidance

Washington State Department of Ecology. Wetland Guidance for Critical Area Ordinance (CAO) Updates: Western and Eastern Washington. 2022. https://apps.ecology.wa.gov/publications/documents/2206014.pdf. Accessed 3/1/2025 Correction to Appendix E, Table 2: for western WA. April 2024. https://apps.ecology.wa.gov/publications/parts/2206014part1.pdf

Washington State Department of Ecology, U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. (2021). Wetland Mitigation in Washington State–Part 1: Agency Policies and Guidance (Version 2). Washington State Department of Ecology Publication #21-06-003. https://apps.ecology.wa.gov/publications/documents/2106003.pdf

## d. Fish and Wildlife Habitat

### i. Anadromous Fisheries


King County. iMap: Environmentally Sensitive Areas, Chinook distribution layer. https://gismaps.kingcounty.gov/iMap/ Accessed 3.1.2025

Washington Department of Fish and Wildlife. Integrated Fish Distribution map. Updated 9.30.2024, https://geo.wa.gov/datasets/wdfw::statewide-washington-integrated-fish-distribution/explore?location=0.131713%2C59.327842%2C0.00

Washington Department of Fish and Wildlife. SalmonScape. Map.(n.d) https://apps.wdfw.wa.gov/salmonscape/map.html Accessed 3.1.2025

Washington Department of Natural Resources. Fish Barrier Map Forest Practices Application Mapping Tool (FPAMT) https://fpamt.dnr.wa.gov/2d-view#activity?-13608551,-13602474,6058008,6060845?WADNR_PUBLIC_FP_Misc!0!4!,WADNR_PUBLIC_FP_Hydro!3!1!,WADNR_PUBLIC_FP_Water_Type!1!,WADNR_PUBLIC_OCIO_Parcels!0!,WADNR_PUBLIC_FP_Road_Maint_Pts!0!,

WRIA 8 Salmon Recovery Council. 2017. Lake Washington/Cedar/ Sammamish Watershed Chinook Salmon Conservation Plan 10-year Update (2017). Water Resource Inventory Area (WRIA) 8, Seattle, WA. https://govlink.org/watersheds/8/planning/chinook-conservation-plan.aspx


### ii. Streams


City of Kirkland. Kirkland Watersheds https://kirkland-watersheds-kirklandwa.hub.arcgis.com/ Accessed 03.01.2025

City of Kirkland. Stream Habitat Dashboard. Stream Habitat | Kirkland Watersheds https://kirkland-watersheds-kirklandwa.hub.arcgis.com/pages/stream-habitat-dashboard. Accessed 03.01.2025

City of Kirkland. Water Quality Dashboard | Kirkland Watersheds https://kirkland-watersheds-kirklandwa.hub.arcgis.com/pages/water-quality Accessed 03.01.2025

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Henrichsen, E. Stream Buffer Literature Review for the City of Kirkland. 2025.

King County. Beavers in King County. Web page. https://kingcounty.gov/en/dept/dnrp/nature-recreation/environment-ecology-conservation/wildlife/beavers

King County. iMap: Environmentally Sensitive Areas, Stream Type Layer, https://gismaps.kingcounty.gov/iMap/ Accessed 3.1.2025

Quinn, T., G.F. Wilhere, and K.L. Krueger, technical editors. Revised 2020. Riparian Ecosystems, Volume 1: Science Synthesis and Management Implications. Habitat Program, Washington Department of Fish and Wildlife, Olympia. https://wdfw.wa.gov/publications/01987

Rentz, R., A. Windrope, K. Folkerts, and J. Azerrad. 2020. Riparian Ecosystems, Volume 2: Management Recommendations. Habitat Program, Washington Department of Fish and Wildlife, Olympia. https://wdfw.wa.gov/publications/01988

Stormwater Action Monitoring Program, US Geological Survey "Status and Trends Study of Puget Lowland Ecoregion Streams: Evaluation of the First Year (2015) of Monitoring Data" https://www.ezview.wa.gov/Portals/_1962/Documents/SAM/FS%23009_PugetLowlandEcoregionStreams.pdf

Stormwater Action Monitoring Program, US Geological Survey 2020"Puget Small Streams Monitoring Program Water Year 2020". https://www.ezview.wa.gov/Portals/_1962/Documents/SAM/D4.1_AnnualReport_2020.pdf

Washington Department of Ecology Western Washington NPDES Phase 1 Stormwater Permit. Final S8.D Data characterization 2009-2013 https://apps.ecology.wa.gov/publications/documents/1503001.pdf

## iii. Site Potential Tree Height

Jacobson, AL. Trees of Seattle, The Complete Tree-finder's Guide to the City's 740 Varieties. First printing. 1990. Sasquatch Books. Seattle

Washington Department of Fish and Wildlife. 2025. Guidelines for Determining Site Potential Tree Height from Field Measurements. Olympia, WA. https://wdfw.wa.gov/sites/default/files/publications/02564/wdfw02564.pdf

Pojar J and Mackinnon A. Plants of the Pacific Northwest Coast. Lone Pine Publishing, B.C Ministry of Forest. 1994

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Washington Department of Fish and Wildlife. Site Potential Tree Height Calculator. Accessed 5-2025. https://geodataservices.wdfw.wa.gov/hp/spth/

Washington State Legislature
WAC 222.30.021 "Western Washington Riparian Management Zones" https://app.leg.wa.gov/wac/default.aspx?cite=222-30-021
WAC222.30.040 "Shade requirements to maintain water temperature" https://app.leg.wa.gov/WAC/default.aspx?cite=222-30-040
WSR Filing Number 23-05-089 2/14/2023 lawfilesext.leg.wa.gov/law/wsr/2023/05/23-05-089.htm

### iv. Upland Habitats

Priority Habitats and species Maps: web page. https://wdfw.wa.gov/species-habitats/at-risk/phs/maps

Washington Department of Fish and Wildlife. Priority Habitats and Species Local Government User Guide. 5.12.2023 https://wdfw.wa.gov/sites/default/files/publications/02426/wdfw02426.pdf

Washington Natural Heritage Program. Rare Plant and Ecosystem Locations. Map. https://experience.arcgis.com/experience/174566100f2a47bebe56db3f0f78b5d9/page/Rare-Plant-and-Ecosystem-Locations#data_s=id%3AdataSource_1-18579fd4769-layer-42-18579fd47f9-layer-43%3A308376

## e. Geological Hazardous Areas

Associated Earth Sciences Incorporated. (2018). *Geologic Hazard Code Update – Gap Analysis and Best Available Science Consistency Review. Link pending*.

Department of Commerce. (2021, February 3). *Geologically Hazardous Areas* [Webinar]. https://vimeo.com/510973729/acc2e513b8

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